

(19)



JAPANESE PATENT OFFICE

## PATENT ABSTRACTS OF JAPAN

(11) Publication number: 2001143736 A

(43) Date of publication of application: 25.05.01

(51) Int. Cl.

H01M 8/04

H01M 8/06

(21) Application number: 11320383

(22) Date of filing: 10.11.99

(71) Applicant: TOSHIBA CORP

(72) Inventor: KUWABARA TAKESHI  
MIYOSHI RINZO  
SAKAI KATSUNORI  
AOKI TSUTOMU

## (54) POWER SUPPLY SYSTEM

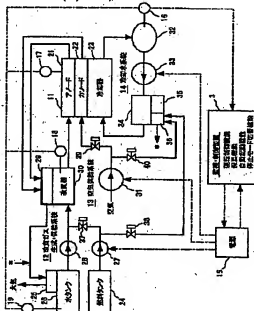
## (57) Abstract:

**PROBLEM TO BE SOLVED:** To prevent deterioration or break of system caused by freezing and provide a shortened start time and steady start by having an automatic heat insulation function of a fuel cell unit in stop and storage of the system.

**SOLUTION:** A power supply system comprises a fuel cell 11, reformed gas generating/supplying system 12, an air supply system 13, a cooling water system 14, a various kind of an auxiliary unit for supplying/circulating and heating arranged within the systems 12-14 and a fuel unit 1 having a power supply 15 for an auxiliary unit and a battery 2 as a power supply, and further comprises temperature detectors 16-19 and a monitoring/controlling unit 3. In stopping and storage of the system, the temperature detectors 16-19 automatically monitors the temperature of at least of the fuel cell body 11 and the cell cooling water. The monitoring/controlling unit 3 issues instruction into the power supply 15 for the auxiliary unit to operate the necessary auxiliary unit and the heat

insulation function in the case where a measuring value obtained from the temperature detectors 16-19 is temperature requiring a heat insulation.

COPYRIGHT: (C)2001,JPO



**Disclaimer:**

This English translation is produced by machine translation and may contain errors. The JPO, the INPIT, and those who drafted this document in the original language are not responsible for the result of the translation.

**Notes:**

1. Untranslatable words are replaced with asterisks (\*\*\*\*).
2. Texts in the figures are not translated and shown as it is.

Translated: 16:56:57 JST 04/26/2007

Dictionary: Last updated 03/16/2007 / Priority:

---

**CLAIMS**

---

**[Claim(s)]**

[Claim 1] A fuel cell body and reformed gas generation / supply system which reforms raw materials and mineral fuel with a refining machine using refining service water, An air supply system, the cooling water system which circulates cell cooling water, and the auxiliary machinery equipment for supply / circulation formed in each system, In the power supply system equipped with the fuel cell equipment which has the auxiliary machinery equipment for heating formed in said reformed gas generation / supply system and the cooling water system, and a power source for auxiliary machinery equipment, and a dc-battery (rechargeable battery) as a power source The thermometric element which checks the temperature of said fuel cell body and said cell cooling water automatically at least in halt / storage state of said power supply system, When the measured value which receives the signal from said thermometric element and is acquired from this signal becomes the temperature which requires incubation The power supply system characterized by having the monitor and control equipment which takes out instructions to said power source for auxiliary machinery equipment so that the auxiliary machinery equipment according to the object which requires incubation of the auxiliary machinery equipment for said supply / circulation and the auxiliary machinery equipment for said heating may be operated and an insulation function may be operated.

[Claim 2] Said reformed gas generation / supply system has the fuel tank in which said raw materials and mineral fuel are stored, and the water tank which stores said refining service water according to an individual. It is the power supply system according to claim 1 characterized by having been constituted so that raw materials and mineral fuel and refining service water might be supplied to a refining machine according to an individual, and constituting said thermometric element so that it may check automatically also about the temperature of said refining machine and said refining service water in addition to the temperature of said fuel cell body and said cell cooling water.

[Claim 3] Said reformed gas generation / supply system has the composite fuel storage tank which unified a means to store said raw materials and mineral fuel, and a means to

store said refining service water. The power supply system according to claim 1 characterized by forming the storage tank of the fuel for incubation for supplying the auxiliary machinery equipment for said heating apart from said composite fuel storage tank.

[Claim 4] Claim 1 characterized by making said dc-battery serve a double purpose as said power source for auxiliary machinery equipment - a power supply system given in any 1 term of three.

[Claim 5] Have the starting system which starts said power supply system automatically, and the remaining capacity monitor which supervises the remaining capacity of said dc-battery, and [ said monitor and control equipment ] By receiving the signal from said remaining capacity monitor, and taking out instructions to said starting system, when the remaining capacity obtained from this signal changes into a lack state The power supply system according to claim 4 which said starting system is operated, makes said fuel cell equipment a power generation state, and is characterized by being constituted so that said dc-battery may be made to charge.

[Claim 6] Said monitor and control equipment is a power supply system given in Claim 1 characterized by having the function which can be changed to either of the incubation stop modes when said insulation function does not operate in halt / storage state of said power supply system, and in which stop mode and an insulation function usually operate automatically - any 1 term of five.

[Claim 7] Said cooling water system is a power supply system given in Claim 1 characterized by having a combustion burner as auxiliary machinery equipment for said heating - any 1 term of six.

[Claim 8] Said cooling water system is a power supply system given in Claim 1 characterized by having an electric heater as auxiliary machinery equipment for said heating - any 1 term of six.

[Claim 9] Claim 1 characterized by using a source power supply as said power source for auxiliary machinery equipment - a power supply system given in any 1 term of eight.

## DETAILED DESCRIPTION

---

[Detailed Description of the Invention]

[0001]

[Field of the Invention] This invention relates to the power supply system which contains a fuel cell especially about the power supply system for supplying power.

[0002]

[Description of the Prior Art] It has a fuel cell and a rechargeable battery as a power source conventionally as a power supply system containing a fuel cell. The power supply system of the type which charges a rechargeable battery and supplies power from the charged rechargeable battery to a load with a fuel cell is proposed (for example, JP,H6-124720,A,

JP,H10-40931,A, etc.). These power supply systems have the composition of charging the power from a fuel cell at a rechargeable battery, and it is possible to supply power to loads, such as a motor for actuation of an electric vehicle, at stability.

[0003] Moreover, as a fuel cell which uses the above fuel cells and rechargeable batteries for the power supply system used as the power source, application of the fuel cell of various kinds of power generation methods is achieved. Especially, since the fuel cell of the type which uses as a fuel the reformed gas which reforms raw materials and mineral fuel, such as a methanol, has various kinds of advantages, such as excelling in system efficiency, development of the power supply system using this type of fuel cell is demanded.

[0004]

[Problem(s) to be Solved by the Invention] By the way, since the power supply system containing the above fuel cells will be in halt / storage state with the temperature according to the temperature of the operating environment, it may fall to the freezing point of the cooling medium especially adopted as the power supply system as the operating environment is a cold district region. In such a case, a power supply system may damage and deteriorate by freezing of a cooling medium etc.

[0005] On the other hand, various techniques for keeping a fuel cell warm and preventing freezing conventionally, are proposed. For example, in JP,H7-169475,A, when the temperature in a fuel cell body is judged with a temperature selector and temperature lowering is produced, without using an external power, the method of keeping a fuel cell warm, without using an external power by burning raw materials and mineral fuel with a catalyzed combustion machine is indicated. Moreover, in JP,H11-214025,A, an OAT is judged with a control unit, when an OAT falls, a fuel cell is started automatically, and the equipment which adopted the method of preventing freezing of cooling water using generation of heat at the time of the generating operation of a fuel cell body is indicated.

[0006] However, sufficient effectiveness cannot be acquired when such a conventional incubation technique is applied to the power supply system using the fuel cell which uses reformed gas as a fuel. First, the method of the actuation dependability of the insulation function of keeping a fuel cell warm without using an external power which was indicated to JP,H7-169475,A is inadequate when the catalyzed combustion machine for incubation must be added. Moreover, since it is the method of keeping only a fuel cell body warm, it is difficult to keep the whole fuel cell equipment warm by this method.

[0007] By the method of, making operational status a fuel cell which was indicated to JP,H11-214025,A on the other hand, and keeping it warm, the balance control of processing of a heating value required for incubation and generated energy becomes complicated. Moreover, this method is related with the power supply system using the fuel cell which uses hydrogen gas as a fuel, and this type of the system configuration and the principle of operation of a power supply system completely differ from the power supply system using the fuel cell which uses reformed gas as a fuel. Therefore, applying the

method indicated in this gazette to the latter power supply system with which fields differ itself has unreasonableness.

[0008] Are proposed in order that this invention may solve the trouble of the above conventional technology, and [ the object ] By giving the automatic insulation function of the fuel cell equipment under shutdown and storage of a system; it is preventing degradation and breakage of the system by freezing of a cooling medium etc., and offering the reliable power supply system which can shorten warm-up time and can be started certainly.

[0009]

[Means for Solving the Problem] The automatic insulation function under shutdown or storage is realized by this invention's checking the temperature in fuel cell equipment automatically, and operating auxiliary machinery equipment, such as the existing pumps and heating apparatus, according to the measured temperature.

[0010] Reformed gas generation / supply system for which the power supply system concerning invention of Claim 1 reforms a fuel cell body and raw materials and mineral fuel with a refining machine using refining service water, An air supply system, the cooling water system which circulates cell cooling water, and the auxiliary machinery equipment for supply / circulation formed in each system. In the power supply system equipped with the fuel cell equipment which has the auxiliary machinery equipment for heating formed in said reformed gas generation / supply system and the cooling water system, and a power source for auxiliary machinery equipment, and a dc-battery (rechargeable battery) as a power source, it is characterized by having a thermometric element and the monitor and control equipment.

[0011] Here, in halt / storage state of a power supply system, a thermometric element is constituted so that the temperature of a fuel cell body and cell cooling water may be checked automatically at least. When [ moreover, ] the measured value which the monitor and control equipment receives the signal from a thermometric element, and is acquired from this signal becomes the temperature which requires incubation It is equipment which takes out instructions to the power source for auxiliary machinery equipment so that the auxiliary machinery equipment according to the object which requires incubation of the auxiliary machinery equipment for supply / circulation and the auxiliary machinery equipment for heating may be operated and an insulation function may be operated.

[0012] In this power supply system, the monitor and control equipment receives the signal of the thermometric element which supervises the temperature of the fuel cell body which has fear of freezing during the shutdown of a system, or storage, or its cell cooling water, and when measured value becomes the reference temperature set up beforehand, it takes out instructions to the power source for auxiliary machinery equipment. By these instructions, the auxiliary machinery equipment for heating of the auxiliary machinery equipment for supply / circulation of a fuel feed pump, a cooling water circulating pump, the blower for air supply, etc., the heating apparatus of cell cooling water, etc. can be started, cooling water can be warmed, and a fuel cell body can be warmed with this warmed cooling

water. Therefore, since the automatic insulation function of the fuel cell equipment under shutdown or storage can be given, degradation and breakage of the system by freezing of cooling water etc. can be prevented.

[0013] The power supply system concerning invention of Claim 2 is set to the power supply system of Claim 1. Reformed gas generation / supply system has the fuel tank in which raw materials and mineral fuel are stored, and the water tank which stores refining service water according to an individual. It is characterized by having been constituted so that raw materials and mineral fuel and refining service water might be supplied to a refining machine according to an individual, and constituting a thermometric element so that it may check automatically also about the temperature of a refining machine and refining service water in addition to the temperature of a fuel cell body and cell cooling water.

[0014] In this power supply system, [ the monitor and control equipment ] It adds to the temperature of the fuel cell body which has fear of freezing during the shutdown of a system, or storage, or its cell cooling water. The signal of the thermometric element which supervises the temperature of the refining machine which has fear of freezing similarly, or refining service water is received, and when measured value becomes the reference temperature set up beforehand, instructions are taken out to the power source for auxiliary machinery equipment. While starting the heating apparatus of a refining machine etc. and warming cooling water and a fuel cell body by these instructions in addition to a fuel feed pump, a cooling water circulating pump and the blower for air supply, the heating apparatus of cell cooling water, etc., a refining machine and refining service water can be warmed. Therefore, also when fear of freezing is in a refining machine or refining service water, these can be warmed certainly and sufficient automatic insulation function for fuel cell equipment can be given.

[0015] The power supply system concerning invention of Claim 3 is set to the power supply system of Claim 1. The storage tank of the fuel for incubation for reformed gas generation / supply system to have the composite fuel storage tank for which a means to store raw materials and mineral fuel, and a means to store refining service water were unified, and supply the auxiliary machinery equipment for heating is characterized by forming a composite fuel storage tank independently.

[0016] Since the mixed liquor of raw materials and mineral fuel, such as a methanol, and refining service water is used in this power supply system compared with the case where a fuel tank and a water tank are prepared according to an individual and a freezing point can be made low enough according to that mixing ratio, There is no possibility that mixed liquor may freeze also in a cold district region, and incubation of a refining machine and refining service water becomes unnecessary. On the other hand, since the fuel for incubation can be supplied to the auxiliary machinery equipment for heating, on the other hand, a fuel cell body and its cell cooling water can be warmed certainly, and sufficient automatic insulation function for fuel cell equipment can be given like the power supply system of Claim 2.

[0017] The power supply system concerning invention of Claim 4 is characterized by

making a dc-battery serve a double purpose as a power source for auxiliary machinery equipment in the power supply system of Claim 1 - any 1 term of three. In this power supply system, the dc-battery which works as a power source for auxiliary machinery equipment can realize an insulation function independently, without needing an external power.

[0018] In the power supply system of Claim 4, the power supply system concerning invention of Claim 5 has the starting system which starts a power supply system automatically, and the remaining capacity monitor which supervises the remaining capacity of a dc-battery, and is characterized by constituting the monitor and control equipment as follows. That is, the monitor and control equipment receives the signal from a remaining capacity monitor, and by taking out instructions to starting system, it operates this starting system, makes fuel cell equipment a power generation state, and when the remaining capacity obtained from this signal changes into a lack state, it is constituted so that a dc-battery may be made to charge.

[0019] In this power supply system, even if it does not give big allowances to battery capacity, without needing an external power, when the remaining capacity of a dc-battery will be in a lack state, fuel cell equipment can be made to be able to generate automatically and a dc-battery can be charged. Therefore, without being restrained by battery capacity, it can continue at a long period of time, and an automatic insulation function can be maintained.

[0020] The power supply system concerning invention of Claim 6 is set to the power supply system of Claim 1 - any 1 term of five. The monitor and control equipment is usually characterized by having the function which can be changed to either of the incubation stop modes in which an insulation function does not operate, and in which stop mode and an insulation function operate automatically in halt / storage state of a power supply system. In this power supply system, when there are no worries about freezing, useless actuation of an insulation function can be prevented by usually making it stop mode. Therefore, consumption of the useless power accompanying useless actuation of an insulation function can be prevented.

[0021] The power supply system concerning invention of Claim 7 is characterized by a cooling water system having a combustion burner as auxiliary machinery equipment for heating in the power supply system of Claim 1 - any 1 term of six. In this power supply system, since the power consumption which actuation of an insulation function takes is reducible as much as possible, an insulation function is maintainable with little power consumption for a long time.

[0022]

**Disclaimer:**

This English translation is produced by machine translation and may contain errors. The JPO, the INPIT, and those who drafted this document in the original language are not responsible for the result of the translation.

**Notes:**

1. Untranslatable words are replaced with asterisks (\*\*\*\*).
2. Texts in the figures are not translated and shown as it is.

Translated: 16:58:27 JST 04/26/2007

Dictionary: Last updated 03/16/2007 / Priority:

---

## FULL CONTENTS

---

### [Claim(s)]

[Claim 1] A fuel cell body and reformed gas generation / supply system which reforms raw materials and mineral fuel with a refining machine using refining service water, An air supply system, the cooling water system which circulates cell cooling water, and the auxiliary machinery equipment for supply / circulation formed in each system, In the power supply system equipped with the fuel cell equipment which has the auxiliary machinery equipment for heating formed in said reformed gas generation / supply system and the cooling water system, and a power source for auxiliary machinery equipment, and a dc-battery (rechargeable battery) as a power source The thermometric element which checks the temperature of said fuel cell body and said cell cooling water automatically at least in halt / storage state of said power supply system, When the measured value which receives the signal from said thermometric element and is acquired from this signal becomes the temperature which requires incubation The power supply system characterized by having the monitor and control equipment which takes out instructions to said power source for auxiliary machinery equipment so that the auxiliary machinery equipment according to the object which requires incubation of the auxiliary machinery equipment for said supply / circulation and the auxiliary machinery equipment for said heating may be operated and an insulation function may be operated.

[Claim 2] Said reformed gas generation / supply system has the fuel tank in which said raw materials and mineral fuel are stored, and the water tank which stores said refining service water according to an individual. It is the power supply system according to claim 1 characterized by having been constituted so that raw materials and mineral fuel and refining service water might be supplied to a refining machine according to an individual, and constituting said thermometric element so that it may check automatically also about the temperature of said refining machine and said refining service water in addition to the temperature of said fuel cell body and said cell cooling water.

[Claim 3] Said reformed gas generation / supply system has the composite fuel storage tank which unified a means to store said raw materials and mineral fuel, and a means to



store said refining service water. The power supply system according to claim 1 characterized by forming the storage tank of the fuel for incubation for supplying the auxiliary machinery equipment for said heating apart from said composite fuel storage tank.

[Claim 4] Claim 1 characterized by making said dc-battery serve a double purpose as said power source for auxiliary machinery equipment - a power supply system given in any 1 term of three.

[Claim 5] Have the starting system which starts said power supply system automatically, and the remaining capacity monitor which supervises the remaining capacity of said dc-battery, and [ said monitor and control equipment ] By receiving the signal from said remaining capacity monitor, and taking out instructions to said starting system, when the remaining capacity obtained from this signal changes into a lack state The power supply system according to claim 4 which said starting system is operated, makes said fuel cell equipment a power generation state, and is characterized by being constituted so that said dc-battery may be made to charge.

[Claim 6] Said monitor and control equipment is a power supply system given in Claim 1 characterized by having the function which can be changed to either of the incubation stop modes when said insulation function does not operate in halt / storage state of said power supply system, and in which stop mode and an insulation function usually operate automatically - any 1 term of five.

[Claim 7] Said cooling water system is a power supply system given in Claim 1 characterized by having a combustion burner as auxiliary machinery equipment for said heating - any 1 term of six.

[Claim 8] Said cooling water system is a power supply system given in Claim 1 characterized by having an electric heater as auxiliary machinery equipment for said heating - any 1 term of six.

[Claim 9] Claim 1 characterized by using a source power supply as said power source for auxiliary machinery equipment - a power supply system given in any 1 term of eight.

---

#### [Detailed Description of the Invention]

[0001]

[Field of the Invention] This invention relates to the power supply system which contains a fuel cell especially about the power supply system for supplying power.

[0002]

[Description of the Prior Art] It has a fuel cell and a rechargeable battery as a power source conventionally as a power supply system containing a fuel cell. The power supply system of the type which charges a rechargeable battery and supplies power from the charged rechargeable battery to a load with a fuel cell is proposed (for example, JP, H6-124720, A,

JP,H10-40931,A, etc.). These power supply systems have the composition of charging the power from a fuel cell at a rechargeable battery, and it is possible to supply power to loads, such as a motor for actuation of an electric vehicle, at stability.

[0003] Moreover, as a fuel cell which uses the above fuel cells and rechargeable batteries for the power supply system used as the power source, application of the fuel cell of various kinds of power generation methods is achieved. Especially, since the fuel cell of the type which uses as a fuel the reformed gas which reforms raw materials and mineral fuel, such as a methanol, has various kinds of advantages, such as excelling in system efficiency, development of the power supply system using this type of fuel cell is demanded.

[0004]

[Problem(s) to be Solved by the Invention] By the way, since the power supply system containing the above fuel cells will be in halt / storage state with the temperature according to the temperature of the operating environment, it may fall to the freezing point of the cooling medium especially adopted as the power supply system as the operating environment is a cold district region. In such a case, a power supply system may damage and deteriorate by freezing of a cooling medium etc.

[0005] On the other hand, various techniques for keeping a fuel cell warm and preventing freezing conventionally, are proposed. For example, in JP,H7-169475,A, when the temperature in a fuel cell body is judged with a temperature selector and temperature lowering is produced, without using an external power, the method of keeping a fuel cell warm, without using an external power by burning raw materials and mineral fuel with a catalyzed combustion machine is indicated. Moreover, in JP,H11-214025,A, an OAT is judged with a control unit, when an OAT falls, a fuel cell is started automatically, and the equipment which adopted the method of preventing freezing of cooling water using generation of heat at the time of the generating operation of a fuel cell body is indicated.

[0006] However, sufficient effectiveness cannot be acquired when such a conventional incubation technique is applied to the power supply system using the fuel cell which uses reformed gas as a fuel. First, the method of the actuation dependability of the insulation function of keeping a fuel cell warm without using an external power which was indicated to JP,H7-169475,A is inadequate when the catalyzed combustion machine for incubation must be added. Moreover, since it is the method of keeping only a fuel cell body warm, it is difficult to keep the whole fuel cell equipment warm by this method.

[0007] By the method of, making operational status a fuel cell which was indicated to JP,H11-214025,A on the other hand, and keeping it warm, the balance control of processing of a heating value required for incubation and generated energy becomes complicated. Moreover, this method is related with the power supply system using the fuel cell which uses hydrogen gas as a fuel, and this type of the system configuration and the principle of operation of a power supply system completely differ from the power supply system using the fuel cell which uses reformed gas as a fuel. Therefore, applying the

method indicated in this gazette to the latter power supply system with which fields differ itself has unreasonableness.

[0008] Are proposed in order that this invention may solve the trouble of the above conventional technology, and [ the object ] By giving the automatic insulation function of the fuel cell equipment under shutdown and storage of a system, it is preventing degradation and breakage of the system by freezing of a cooling medium etc., and offering the reliable power supply system which can shorten warm-up time and can be started certainly.

[0009]

[Means for Solving the Problem] The automatic insulation function under shutdown or storage is realized by this invention's checking the temperature in fuel cell equipment automatically, and operating auxiliary machinery equipment, such as the existing pumps and heating apparatus, according to the measured temperature.

[0010] Reformed gas generation / supply system for which the power supply system concerning invention of Claim 1 reforms a fuel cell body and raw materials and mineral fuel with a refining machine using refining service water, An air supply system, the cooling water system which circulates cell cooling water, and the auxiliary machinery equipment for supply / circulation formed in each system. In the power supply system equipped with the fuel cell equipment which has the auxiliary machinery equipment for heating formed in said reformed gas generation / supply system and the cooling water system, and a power source for auxiliary machinery equipment, and a dc-battery (rechargeable battery) as a power source, it is characterized by having a thermometric element and the monitor and control equipment.

[0011] Here, in halt / storage state of a power supply system, a thermometric element is constituted so that the temperature of a fuel cell body and cell cooling water may be checked automatically at least. When [ moreover, ] the measured value which the monitor and control equipment receives the signal from a thermometric element, and is acquired from this signal becomes the temperature which requires incubation It is equipment which takes out instructions to the power source for auxiliary machinery equipment so that the auxiliary machinery equipment according to the object which requires incubation of the auxiliary machinery equipment for supply / circulation and the auxiliary machinery equipment for heating may be operated and an insulation function may be operated.

[0012] In this power supply system, the monitor and control equipment receives the signal of the thermometric element which supervises the temperature of the fuel cell body which has fear of freezing during the shutdown of a system, or storage, or its cell cooling water, and when measured value becomes the reference temperature set up beforehand, it takes out instructions to the power source for auxiliary machinery equipment. By these instructions, the auxiliary machinery equipment for heating of the auxiliary machinery equipment for supply / circulation of a fuel feed pump, a cooling water circulating pump, the blower for air supply, etc., the heating apparatus of cell cooling water, etc. can be started, cooling water can be warmed, and a fuel cell body can be warmed with this warmed cooling

water. Therefore, since the automatic insulation function of the fuel cell equipment under shutdown or storage can be given, degradation and breakage of the system by freezing of cooling water etc. can be prevented.

[0013] The power supply system concerning invention of Claim 2 is set to the power supply system of Claim 1. Reformed gas generation / supply system has the fuel tank in which raw materials and mineral fuel are stored, and the water tank which stores refining service water according to an individual. It is characterized by having been constituted so that raw materials and mineral fuel and refining service water might be supplied to a refining machine according to an individual, and constituting a thermometric element so that it may check automatically also about the temperature of a refining machine and refining service water in addition to the temperature of a fuel cell body and cell cooling water.

[0014] In this power supply system, [ the monitor and control equipment ] It adds to the temperature of the fuel cell body which has fear of freezing during the shutdown of a system, or storage, or its cell cooling water. The signal of the thermometric element which supervises the temperature of the refining machine which has fear of freezing similarly, or refining service water is received, and when measured value becomes the reference temperature set up beforehand, instructions are taken out to the power source for auxiliary machinery equipment. While starting the heating apparatus of a refining machine etc. and warming cooling water and a fuel cell body by these instructions in addition to a fuel feed pump, a cooling water circulating pump and the blower for air supply, the heating apparatus of cell cooling water, etc., a refining machine and refining service water can be warmed. Therefore, also when fear of freezing is in a refining machine or refining service water, these can be warmed certainly and sufficient automatic insulation function for fuel cell equipment can be given.

[0015] The power supply system concerning invention of Claim 3 is set to the power supply system of Claim 1. The storage tank of the fuel for incubation for reformed gas generation / supply system to have the composite fuel storage tank for which a means to store raw materials and mineral fuel, and a means to store refining service water were unified, and supply the auxiliary machinery equipment for heating is characterized by forming a composite fuel storage tank independently.

[0016] Since the mixed liquor of raw materials and mineral fuel, such as a methanol, and refining service water is used in this power supply system compared with the case where a fuel tank and a water tank are prepared according to an individual and a freezing point can be made low enough according to that mixing ratio, There is no possibility that mixed liquor may freeze also in a cold district region, and incubation of a refining machine and refining service water becomes unnecessary. On the other hand, since the fuel for incubation can be supplied to the auxiliary machinery equipment for heating, on the other hand, a fuel cell body and its cell cooling water can be warmed certainly, and sufficient automatic insulation function for fuel cell equipment can be given like the power supply system of Claim 2.

[0017] The power supply system concerning invention of Claim 4 is characterized by

making a dc-battery serve a double purpose as a power source for auxiliary machinery equipment in the power supply system of Claim 1 - any 1 term of three. In this power supply system, the dc-battery which works as a power source for auxiliary machinery equipment can realize an insulation function independently, without needing an external power.

[0018] In the power supply system of Claim 4, the power supply system concerning invention of Claim 5 has the starting system which starts a power supply system automatically, and the remaining capacity monitor which supervises the remaining capacity of a dc-battery, and is characterized by constituting the monitor and control equipment as follows. That is, the monitor and control equipment receives the signal from a remaining capacity monitor, and by taking out instructions to starting system, it operates this starting system, makes fuel cell equipment a power generation state, and when the remaining capacity obtained from this signal changes into a lack state, it is constituted so that a dc-battery may be made to charge.

[0019] In this power supply system, even if it does not give big allowances to battery capacity, without needing an external power, when the remaining capacity of a dc-battery will be in a lack state, fuel cell equipment can be made to be able to generate automatically and a dc-battery can be charged. Therefore, without being restrained by battery capacity, it can continue at a long period of time, and an automatic insulation function can be maintained.

[0020] The power supply system concerning invention of Claim 6 is set to the power supply system of Claim 1 - any 1 term of five. The monitor and control equipment is usually characterized by having the function which can be changed to either of the incubation stop modes in which an insulation function does not operate, and in which stop mode and an insulation function operate automatically in halt / storage state of a power supply system. In this power supply system, when there are no worries about freezing, useless actuation of an insulation function can be prevented by usually making it stop mode. Therefore, consumption of the useless power accompanying useless actuation of an insulation function can be prevented.

[0021] The power supply system concerning invention of Claim 7 is characterized by a cooling water system having a combustion burner as auxiliary machinery equipment for heating in the power supply system of Claim 1 - any 1 term of six. In this power supply system, since the power consumption which actuation of an insulation function takes is reducible as much as possible, an insulation function is maintainable with little power consumption for a long time.

[0022] The power supply system concerning invention of Claim 8 is characterized by a cooling water system having an electric heater as auxiliary machinery equipment for heating in the power supply system of Claim 1 - any 1 term of six. In this power supply system, although the power of an external power is consumed compared with the power supply system of Claim 7, the same insulation function is obtained.

[0023] The power supply system concerning invention of Claim 9 is characterized by using

a source power supply as a power source for auxiliary machinery equipment in the power supply system of Claim 1 - any 1 term of eight. In this power supply system, without being restrained by the capacity of a dc-battery, with the power from a source power supply, it can continue at a long period of time, and an automatic insulation function can be maintained with high dependability.

[0024]

[Embodiment of the Invention] [1. Form] of the 1st operation

[Composition of the whole 1-1. power supply system] Below, the form of the suitable operation in the hybrid power supply system which consists of the fuel cell equipment and the dc-battery of this invention is explained with reference to drawing 1 and drawing 2 at a detail. First, drawing 1 is the block diagram showing the outline of composition of having connected the power supply system equipped with fuel cell equipment and a dc-battery as a power source to load equipment, such as an electric vehicle.

[0025] As shown in this drawing 1, [ the power supply system of the form of this operation ] In addition to the fuel cell equipment 1 and the dc-battery 2 which work as a power source, the monitor and control equipment 3, relay-4, the starting system 5, the remaining capacity monitor 6, and the switch 7 are used as the main components, and load equipment 8, such as an electric vehicle, is connected to this power supply system. Below, sequential explanation is given about each component and load equipment of this power supply system.

[0026] Connection of fuel cell equipment 1 is respectively attained with a dc-battery (rechargeable battery) 2 and load equipment 8 through the switch 7 or the relay 4. According to the connectable state of such a circuit, fuel cell equipment 1 charges a dc-battery 2, or drives load equipment 8.

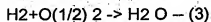
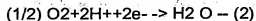
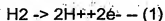
[0027] A dc-battery 2 is a power unit which supplies power to load equipment 8 with fuel cell equipment 1. With the form of this operation, although the lithium dc-battery was used, rechargeable batteries of other type, such as a nickel-hydrogen battery and a lead accumulator, can also be used. Since this dc-battery 2 needs to work as a main power source which drives load equipment 8 at the time of start up of a power supply system so that it may mention later, the capacity of the dc-battery 2 is what gave predetermined allowances based on the service condition expected.

[0028] Load equipment 8 generates driving force in response to supply of the power from fuel cell equipment 1 or a dc-battery 2. This driving force is told to the front wheel and/or rear wheel of a car through the axle in the car carrying a power supply system, for example, and turns into driving force which makes it run a car. This load equipment 8 receives control of the monitor and control equipment 3. The monitor and control equipment 3 takes out instructions to load equipment 4 according to an operator's load command, and the signal for [ as an instruction ] carrying out load operation is exchanged.

[0029] [Composition of 1-2. fuel cell equipment] Drawing 2 is the block diagram showing the composition of the fuel cell equipment 1 of drawing 1. First, the fuel cell body 11 which

constitutes fuel cell equipment 1 is the fuel cell of a solid polymer electrolyte mold, and has the stack structure which laminated two or more single cells which are constitutional units. This fuel cell body 1 receives supply of the fuel gas containing hydrogen in the negative-electrode side, and electromotive force is acquired according to the electrochemical reaction shown below in response to supply of the oxidizing gas containing oxygen to the positive-electrode side.

[Formula 1]



(1) type shows the anode electrode reaction by the side of a negative electrode, and the cathode [ types / (2) ] electrode reaction by the side of a positive electrode here, respectively, and (3) types express the reaction which occurs by the whole cell.

[0030] This fuel cell equipment 1 as main components first To the fuel cell body 11 and the fuel cell body 11, [ reformed gas ] Auxiliary machinery equipment and the monitor and control equipment 3, such as the cooling water system 14 which makes reformed gas generation / supply system 12 for supplying and the fuel cell body 11 circulate through the air supply system 13 for supplying air and the cooling water for fuel cell body 11, and pumps, are equipped with the power-source 15 grade for auxiliary machinery equipment which supplies power. and this fuel cell equipment 1 -- these components -- in addition, it has two or more thermometric elements 16-19 arranged according to this invention, and is supervised and controlled by the monitor and control equipment 3 mentioned above based on the signal from these thermometric elements 16-19. Below, sequential explanation is given about the composition of each part.

[0031] The fuel cell body 11 consists of a cooling room 23 with the passage which supplies the cooling water which has the function which discharges outside the anode (negative electrode) 21 with the passage which supplies hydrogen containing gas, the cathode (positive electrode) 22 with the passage which supplies the air containing oxidizing gas, and the heat produced at the above-mentioned reaction.

[0032] [ reformed gas generation / supply system 12 / water tank / 26 / the fuel tank 24 and / which has the heating apparatus 25 for water tanks / with the fuel feed pump 27 and the water supply pump 28 ] in the refining machine 30 which supplies raw-materials-and-mineral-fuel gas and water via an evaporator (not shown), respectively, and has the burner 29 for refining machine heating -- hydrogen -- generating rich fuel gas -- this hydrogen -- rich fuel gas is supplied to the anode 21 of the fuel cell body 11. The air supply system 13 is equipped with the blower 31, and supplies air to the cathode 22 of the fuel cell body 11 by this blower 31.

[0033] The cooling water system 14 is equipped with the cooling water accumulator 32, the cooling water circulating pump 33, and the cooling water heat exchanger 34 sequentially from the outflow of cooling water of the fuel cell body 11. Here, the cooling water heat

exchanger 34 is equipped with the burner 36 for cooling water heating which has the radiator 35 which has the function which lowers temperature, and the function which raises temperature, and controls the temperature of the cooling water supplied to the fuel cell body 11 using these radiators 35 and the burner 36 for cooling water heating. The power source 15 for auxiliary machinery equipment supplies power under control by the monitor and control equipment 3 to the pumps and the monitor and control equipment 3 of the fuel feed pump 27, the cooling water circulating pump 33, and blower 31 grade. This power source 15 for auxiliary machinery equipment is a source power supply.

[0034] Among two or more thermometric elements 16-19, the thermometric element 16 is a circulating-water-temperature detector which detects the circulating water temperature of the cooling water accumulator 32, and the thermometric element 17 is a battery temperature detector which detects the temperature of the fuel cell body 11. Moreover, the thermometric element 18 is a refining machine thermometric element which detects the temperature of the refining machine 30, and the thermometric element 19 is a water tank thermometric element which detects the temperature of the water tank 26.

[0035] On the other hand in reformed gas generation / supply system 12, the 1st opening and closing valve 37 for fuels is formed on the line which supplies raw-materials-and-mineral-fuel gas to the refining machine 30 with the fuel feed pump 27 from the fuel tank 24. In addition, the line which supplies raw-materials-and-mineral-fuel gas is also established in the burner 36 for cooling water heating of the cooling water heat exchanger 34 with the fuel feed pump 27, and the 2nd opening and closing valve 38 for fuels is formed on this line.

[0036] Moreover, in the air supply system 13, the 1st opening and closing valve 39 for air is formed on the line which supplies air to the cathode 22 of the fuel cell body 11 by a blower 31. In addition, the line which supplies air is also established in the burner 36 for cooling water heating of the cooling water heat exchanger 34 by the blower 31, and the 2nd opening and closing valve 40 for air is formed on this line.

[0037]